

[54] **PACK FRAME SUSPENSION MEANS**

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224/5 BC, 10, 11, 12

[57] **ABSTRACT**

A pack frame suspension means providing comfort for a person carrying a load. The suspension means includes substantially rigid braces which extend from a rigid pack frame to concavo-convex portions of shoulder straps to control the position of the loaded frame in relation to the shoulder straps, and the person's torso. Freedom of movement is provided in this system by several features, including pivotability or deflectability of the brace members, flexible connection of the braces to the shoulder straps, and/or a sway adjustment ring allowing ongoing adjustment of the relative lengths of the two shoulder straps.

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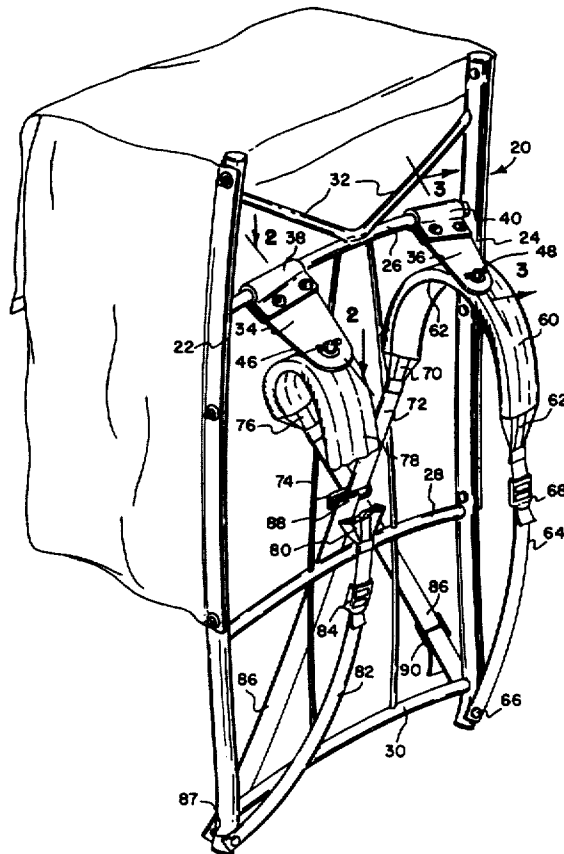
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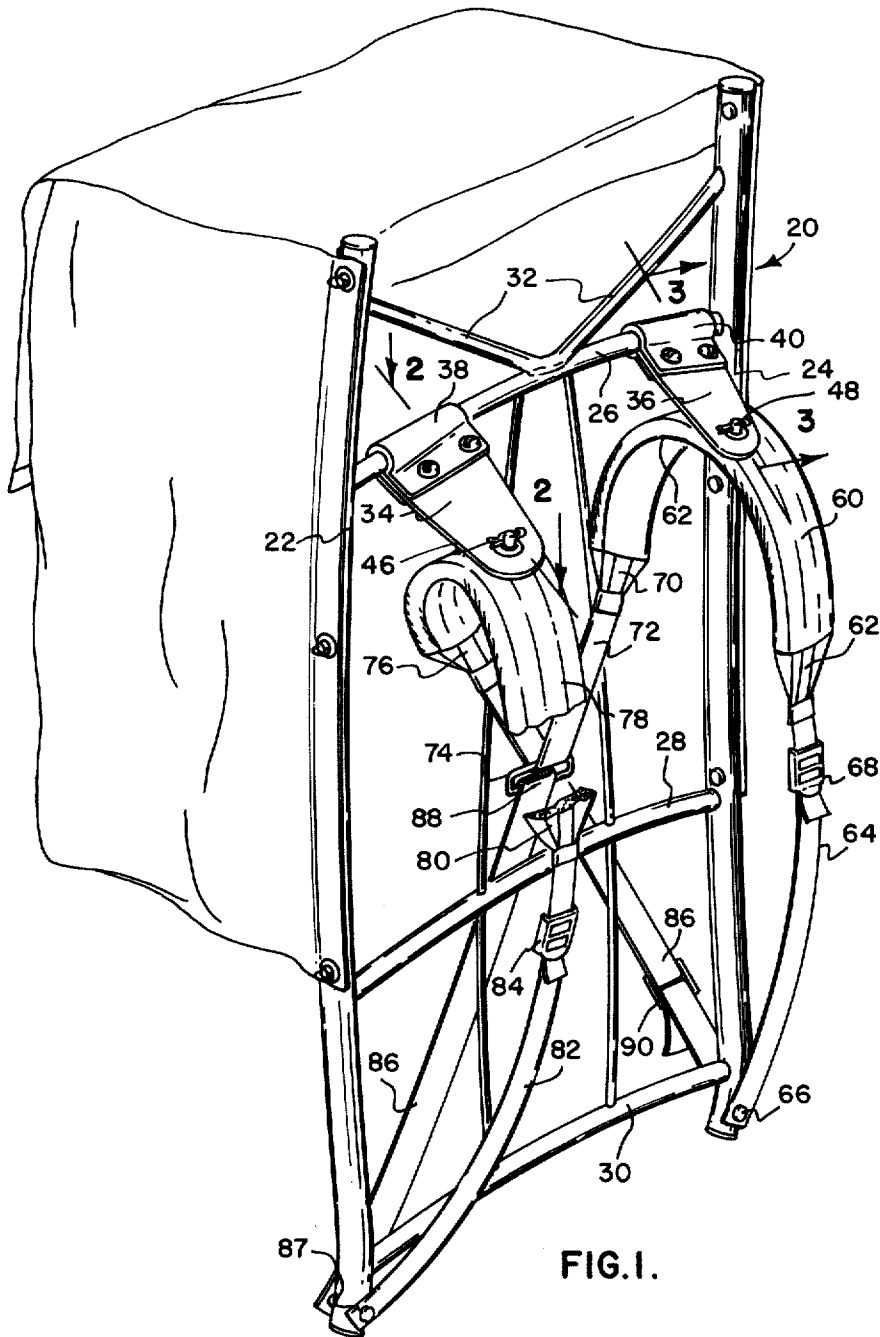
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15 Claims, 5 Drawing Figures





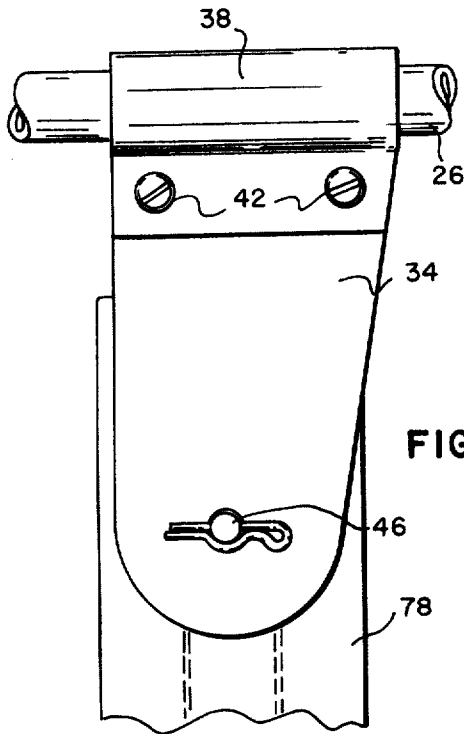


FIG. 2.

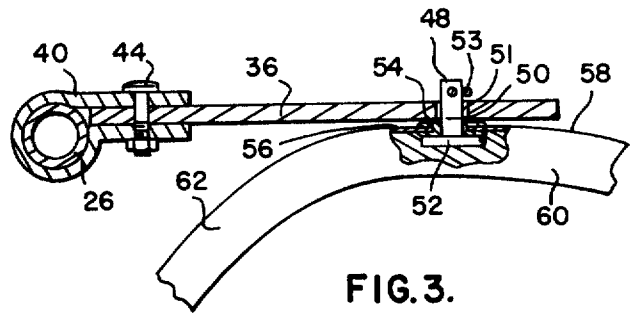


FIG. 3.

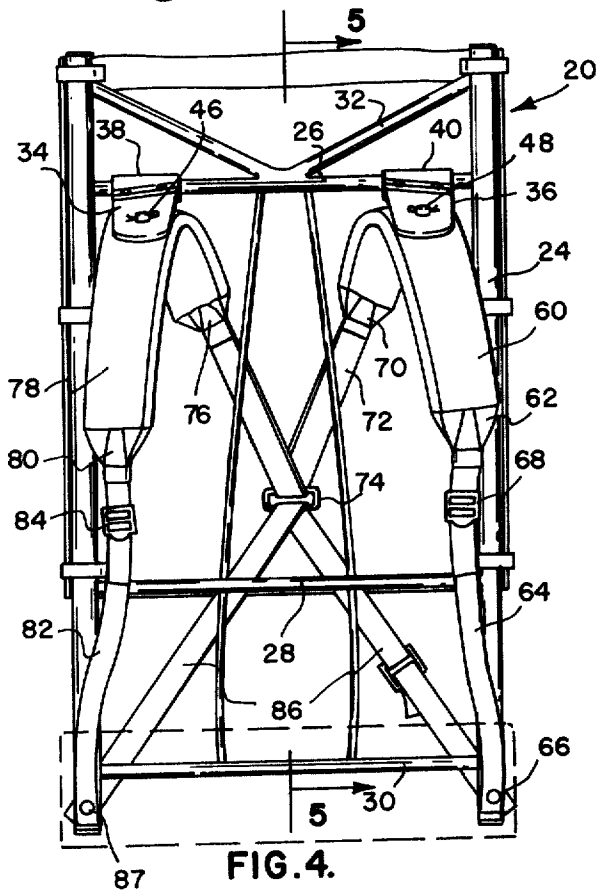


FIG. 4.

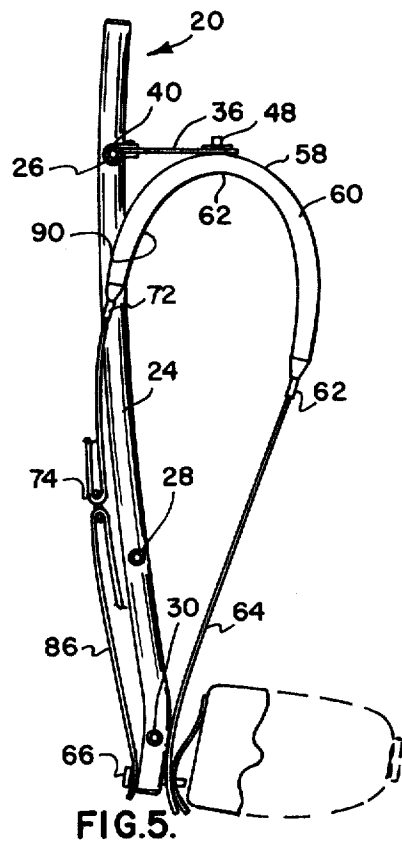


FIG. 5.

PACK FRAME SUSPENSION MEANS**BACKGROUND OF THE INVENTION**

Various pack frame suspension means and shoulder strap mechanisms have been used for mounting pack frames and pack bags on a persons shoulders for carrying various loads, and a great variety of devices have been used for adustably fitting the physical features of a persons shoulders, as well as to provide comfort in the carrying of loads and to also provide for freedom of movement of the persons body relative to the pack frame while various movements occur during the packing of loads on a persons back.

In many instances, however, there are various inertial loadings caused by movement of the load relative to the backpackers movements. These inertial loadings occur during walking and repeat with each step of the backpacker. One such repetitive loading occurs during each step of the backpacker and this is oftentimes accentuated depending upon the terrain, the rapidity of the backpackers movements, the amplitude of his strides. One common movement is a fore and aft movement of the load relative to the torso of the backpacker and another movement is the lateral movement of the load and pack frame in a generally horizontal direction laterally of the backpackers vertical axis. When reactionary movement of the load on the backpacker occurs at substantial amplitude, the load imposes considerable force upon the backpacker's torso. Most prior art pack frame suspension systems have not adequately provided means for damping these relative movements to prevent such relative movements from accelerating and reaching an objectionable magnitude which causes excessive fatigue of the backpacker.

It has been recognized that the center of gravity of a load carried on a pack frame should be as close as possible to the backpacker so that it does not attain substantial leverage and movement force spaced rearwardly of the backpacker, so as to cause undue backward pulling on the shoulder straps in proportion to the load carried.

Accordingly, many backpackers have loaded some of the heavier articles in their frames as high as possible and as close as possible to the back of the backpacker. In many instances such loading has imposed substantial fore and aft dynamic loading of pack frames in the proximity of the shoulder area and in accordance with most prior art pack frames, amplitude of such loading is highly undesirable and has been a source of discomfort and fatigue, substantially out of proportion to the load carried.

SUMMARY OF THE INVENTION

The present invention comprises a novel pack frame suspension means particularly adapted to improve the comfort and stability of a back pack carrying device. It is intended to simplify the harness which mounts the frame to the shoulders of a person carrying a pack frame or the like, such person being commonly known as a backpacker.

The invention comprises a novel shoulder brace means which interconnects a pack frame and generally concavo, convex shoulder engaging portions of shoulder straps directly above the shoulders of the backpacker. The brace means is pivotally mounted on a frame in a disposition to pivot on an axis laterally of the frame and the concavo, convex portions of the shoul-

der straps are connected to the braces forwardly of the frame by means of pivot means having axes disposed generally in an upward and downward direction. The shoulder straps, at the rear of the backpacker, are connected together by a slide strap which extends through a loop shaped slide fixture and this slide fixture is vertically adjustably mounted on the frame, generally at a median portion thereof behind the backpackers spine. The shoulder straps at the forward portion of the backpackers torso are connected generally to lower portions of the frame and generally at opposite sides thereof, and these straps are vertically adjustable as to their free length between the shoulder straps and the lower portions of the frame so that all the foregoing adjustments may be utilized to fit the suspension means of the invention to various backpackers having various dimensions, and additionally to allow equilibrium of loading of both straps relative to the center of gravity of the load in connection with the frame.

The shoulder strap braces stabilize the loaded frame in fore and aft direction at the areas of the straps which engage the shoulders of the wearer or the backpacker, and the shoulder strap braces are free to pivot or deflect resiliently about a horizontal axis or generally lateral axis, and also the shoulder straps are free to pivot about a generally upward and downward axis or a vertical axis relative to the forward ends of the braces.

Accordingly, the shoulder strap braces stabilize the frame relative to the back of the backpacker in a fore and aft direction, and also in a lateral direction, and thus prevent reactional movement of the frame and its load in fore and aft as well as lateral directions, to prevent dynamic load reaction of the frame and the load to attain substantial amplitude and thereby damping such undesirable movements and prevent undue dynamic and reactionary loading on the backpacker, to minimize discomfort and fatigue.

The shoulder strap braces are forcibly movable in a direction laterally toward or away from each other to accommodate the breadth of the backpackers shoulder, and the shoulder straps as well as the shoulder braces in connection with the shoulder straps, allow for tilting of the straps to match the slope of the backpackers shoulders, and due to the fact that the concavo, convex portions of the shoulder straps extend a substantial distance over the front and the back of the backpacker, and in accordance with the operation of the shoulder strap braces of the invention, the need for a back engaging band is obviated. Accordingly, the rigid frame is supported in spaced relation from the backpackers back and thus allows maximum freedom to arch or straighten the back, and further allows maximum room for chest expansion during normal or vigorous respiratory action.

Accordingly, it is an object of the present invention to provide a pack frame suspension means particularly adapted to afford maximum comfort and stability of a load carrying pack frame on a backpackers shoulders and torso.

Another object of the invention is to provide a novel pack frame suspension means which stabilizes a loaded pack frame in fore and aft as well as lateral directions relative to a backpackers shoulders, tending to damp dynamic loading on the backpacker in response to his movements.

Another object of the invention is to provide a pack frame suspension means having substantially rigid

shoulder brace means pivotally interconnecting a pack frame and shoulder straps so as to hold the rigid frame in spaced relation to the rib cage of the backpacker so that a back engaging band is not needed and so as to allow maximum freedom of expansion of the backpackers rib cage to afford maximum respiratory action.

Another object of the invention is to provide for vertical, lateral and angular adjustment of shoulder straps in connection with a pack frame so as to fit the dimensions of various backpackers while at the same time providing means to damp undesirable fore and aft, as well as lateral, load reactions in response to the movements of a backpacker carrying a load on a pack frame suspended by the suspension means of the invention.

Further objects and advantages of the invention may be apparent from the following specification, appended claims and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a pack frame with a pack bag and pack frame suspension means of the invention coupled to the frame and adapted for engagement with the shoulders of a backpacker;

FIG. 2 is an enlarged fragmentary plan view taken from the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken from the line 3—3 of FIG. 1;

FIG. 4 is a reduced front elevational view of the pack frame suspension means of the invention; and

FIG. 5 is a side elevational view of the frame suspension means of the invention taken from the line 5—5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1 of the drawings, the pack frame suspension means of the invention is related to a substantially conventional pack frame 20 which is fabricated of aluminum tubing or any other lightweight material, as desired.

It will be obvious that this particular type of frame is disclosed by way of example only, and that the pack frame suspension means of the invention to be hereinafter described may apply to any mechanical configuration of pack frames, as desired.

The frame 20 is provided with a pair of substantially vertical tubular frame members 22 and 24 and tubular cross members 26, 28 and 30 interconnect the frame members 22 and 24, and an angular brace 32 is coupled to an intermediate portion of the cross member 26 and extends between and in connection with the cross members 22 and 24.

Pivotally mounted on the cross member 26 are a pair of shoulder strap braces 34 and 36. These braces are similar in construction and it will be obvious that they may be pivoted on any frame and not necessarily on a tubular cross member such as the cross member 26, but on any suitable bearings which may be so disposed that they have a lateral axis generally disposed laterally with respect to the vertical portions of the frame such as the vertical members 22 and 24. It will be understood that the axes of the shoulder strap braces 34 and 36 in connection with the frame, may be tilted slightly to the horizontal in order to accommodate angular movements of a persons shoulders or to somewhat match the slope of the shoulders, however, as will be hereinafter described, the braces 34 and 36 may be slightly twisted so

that their planes are tilted to match the slope of a backpackers shoulders, if desired.

Accordingly, it will be seen that the shoulder strap braces 34 and 36 are provided with respective tubular pivot bearing sleeves 38 and 40, respectively, which surround the cross member 26 and are frictionally engaged therewith to provide certain pivotal damping and yet movable longitudinally toward and away from each other on the cross member 26 by forcefully sliding them in order to provide lateral spacing of the shoulder strap braces 34 and 36 so as to accommodate the shoulder spacing of the shoulders of a particular backpacker.

As shown in FIGS. 2 and 3 of the drawings, the shoulder braces 34 and 36 are provided with respective clamp screws 42 and 44 extending therethrough and securing the respective tubular pivot bearings 38 and 40 thereto and around the cross member 26. Alternatively the braces may be of resilient material and may be fixed to the cross member 26, and may deflect upward and downward.

It will be seen that the shoulder strap braces 34 and 36 are provided with pivot bearings 46 and 48, respectively, which have axes disposed generally in an upward and downward direction; however, these axes may be disposed at a slight angle to the vertical depending upon the slope of the backpackers shoulders, as will be hereinafter described.

These pivot bearings 46 and 48 are identical and accordingly, attention is called to the pivot bearing 48 shown in FIG. 3 of the drawings. This bearing 48 comprises a headed pivot pin 50, a head portion 52 of this pivot pin 50 being disposed in a metal eyelet 54, fixed in a fabric skin 56 at an upper convex portion 58 of a shoulder engaging strap 60. This shoulder engaging strap 60 is preferably one which comprises a resilient foam core and a nylon tubular outer sheath.

This strap 60 is provided with a concave lower surface 62 adapted to engage the top of a persons shoulders and, as shown in FIG. 1 of the drawings, this shoulder engaging strap 60 is provided with a first end 62 connected by means of a strap 64 to a fixture 66 generally at the lower end of the frame member 24. This strap 64 is provided with an adjustable fixture 68 in order to adjust the free length of the strap 64 and to thereby adjust the vertical position of the concavo convex shoulder strap 60.

An opposite end 70 of the concavo convex shoulder strap 60 is coupled to a slide strap 72 which is slidably engaged through a metal loop 74 and the slide strap 72 is connected to an end 76 of a shoulder strap 78 pivotally connected to the shoulder strap brace 34 by the pivot bearing 46. Alternatively the ends 70 and 76 of the shoulder straps may be individually adjustably connected to the frame 20 if desired.

As described herein, the ends 70 and 76 of the shoulder straps 60 and 78 are designated second ends, while ends 62 and 80 of the shoulder straps 60 and 78 are designated first ends. The first end 80 of the shoulder strap 78 is connected to an adjusting strap 82, similar to the hereinbefore described strap 64, and this strap 82 is provided with an adjusting fixture 84 so as to adjust the free length of the shoulder strap 78.

The slide loop 74 is engaged by a holding strap 86 and this holding strap is slidably engaged through the loop shaped slide fixture 74, and opposite ends of the holding strap 86 are connected by fixtures 66 and 87 so that an intermediate portion 88 of the holding strap

86 is slidably disposed through the loop shaped fixture 74 and an adjusting fixture 90 on the holding strap 86 adjusts its length so as to provide for vertical adjustment of the slide loop 74 relative to the frame and to thereby provide for vertical adjustment of the second ends 70 and 76 of the shoulder engaging straps 60 and 78. It will be apparent that such adjustment is also accommodated by a pivotal mounting or resilient deflection of the shoulder strap braces 34 and 36 about the lateral axes within the pivot bearing portions 38 and 40, hereinbefore described.

Slide loop 74 is a preferred form of a sway adjustment ring. However, other sway adjustment devices may be used. The term "sway adjustment ring" as used herein refers to any device through which a length of strap (regardless of its cross sectional configuration) could slide (in response to forces exerted through the strap) to change the relative lengths of strap on either side of such ring. Such a ring also serves as an anchor for the joined second ends of the shoulder straps. The sway adjustment ring need not be a circular device but can be in any form to perform the function specified.

The pivot bearings 46 and 48 provide for pivotal movement of intermediate portions of the concavo, convex shoulder engaging straps 78 and 62, respectively, with the pack frame 20 and this is accomplished specifically as shown in FIG. 3 wherein the pin 50 pivots in an opening 51 of the respective shoulder strap brace 36 and a retainer 53 prevents the pin 50 from being displaced from the opening 51.

The axis of the pin 51 may be disposed at acute angle to the vertical in accordance with the slope of a backpackers shoulders, however the axis of the pin 50 is generally upward and downward and accordingly it will be understood that both of the concavo, convex shoulder engaging straps 60 and 78 are thus pivotal relative to their respective shoulder braces about axes extending generally upward and downward, and the shoulder braces are pivotal on the frame on lateral axes extending in a generally horizontal direction and laterally relative to the vertical elements or tubular members 22 and 24 of the frame 20.

When the pack frame suspension means of the invention is worn on a backpackers shoulders, the elements thereof are disposed generally as shown in FIGS. 4 and 5 of the drawings, and, as for example in FIG. 5, the concave surface 62 of the shoulder engaging strap 60 engages the backpackers shoulders and the respective brace 36 spaces the pivot bearing 43 forwardly of the frame, thus holding the frame in spaced relation to the shoulder of the wearer and preventing generally fore and aft movement of the frame relative to the concave surface of the shoulder strap 60 which engages the wearer's respective shoulder. The concave surface 62 of the respective shoulder engaging strap 60 is held in tension by the adjusting strap 64, as hereinbefore described, and the second end 72 of the strap 60 is held by the slide strap 72, as hereinbefore described, in connection with the vertically adjustable slide loop 72 held by the holding strap 86.

The shoulder strap 60, in its concavo, convex configuration, extends over the forward and rearward portions of the respective shoulder of the backpacker and due to the disposition of the brace 36, the frame 20 is stabilized in a fore and aft direction and damped and braced against dynamic fore and aft movements in re-

sponse to the movements of the backpacker as he walks, runs jump, or otherwise moves his body.

Due to the disposition of the relatively rigid shoulder strap braces 34 and 36, at opposite sides of the backpackers neck, spaced slightly therefrom, the shoulder straps are held firmly against the sloping portions of the shoulders and so braced and under frictional engagement, that they do not slide downward on the shoulders, nor laterally, and consequently tend to stabilize the lateral movement or reaction of the pack frame to dynamic loading, and accordingly the dynamic reactionary loading of the frame does not reach substantial amplitude either in forward or rearward directions, or lateral directions, and consequently the reaction forces of the load and frame are minimized in relation to the movements of the backpacker as he carries the load in accordance with the functions of the suspension means of the invention.

It will be seen that the slide strap 72, reciprocally movable through the slide loop 74, allows equilibrium of loading on the shoulder straps of the invention, since they are both connected together at their second ends 72 and 76, and inasmuch as the respective shoulder strap braces are pivotal on the aforementioned lateral axes.

It will be apparent to those skilled in the art that a rearward concave portion 90 of the shoulder engaging strap 60, as shown in FIG. 5, bears upon the back of the backpacker and holds the rigid portion of the frame away from the backpackers rib cage sufficiently so as to allow substantial room for expansion of the rib cage and for normal respiratory action without the need for a conventional back band which has been used in connection with many prior art pack frames for supporting the frame against the back of the backpacker.

The strap 86 may be slackened by adjustment of the fixture 90, and the straps 64 and 82 may be correspondingly shortened by use of the fixtures 68 and 84 respectively, for moving the pivot bearings 46 and 48 forwardly on a back packers shoulders in order to carry the frame 20 close to the wearers back.

The reverse of the foregoing adjustments may cause the pivot bearings to be moved on the shoulders in a rearward direction for carrying the frame 20 in a position substantially spaced from the back of the wearer. Thus different activities of the backpacker may be accommodated depending on physical disposition required or on desires of the backpacker relative to his comfort in varying weather or terrain conditions as well as varying loading requirements.

It will be obvious to those skilled in the art that various modifications may be resorted to without departing from the spirit of the invention.

I claim:

1. A pack frame suspension means comprising: a rigid frame having, when in worn position, top and bottom ends and opposite sides; flexible shoulder straps adjacent to said frame between said top and bottom ends and said opposite sides, said straps including concavo-convex shoulder-engaging portions and having first ends attached near said bottom end of said frame and second ends secured with respect to said frame at a level below said shoulder-engaging portions; substantially rigid brace members coupled to said frame near said top end, extending from said frame, and terminating in free ends generally

aligned with said shoulder-engaging portions of said shoulder straps, said brace members being of substantially fixed dimensions between said couplings to said frame and said free ends;

means connecting said free ends of said brace members with the convex surfaces of said shoulder-engaging portions of said straps; and
a sway adjustment ring, secured to said frame, said second ends of said shoulder straps being joined together through said ring thereby permitting adjustment of the relative lengths of the shoulder straps during certain body movements.

2. The pack frame suspension means of claim 1 wherein said sway adjustment ring is a generally loop shaped member secured to said frame at a level below said shoulder-engaging portions, said shoulder straps forming a portion of strap length, at and near said joined second ends, which is freely slideable through said looped member.

3. The invention as defined in claim 2 wherein: said loop-shaped member is adjustably secured to said frame so as to be adjustable in normally upward and downward directions.

4. The invention as defined in claim 3, wherein: said first ends of said shoulder straps are adjustably connected to said frame for adjusting the free length thereof between said concavo, convex portions of said shoulder straps and respective lower ends of said frame.

5. A pack frame suspension means comprising:
a rigid frame having, when in worn position, top and bottom ends and opposite sides;
flexible shoulder straps adjacent to said frame between said top and bottom ends and said opposite sides, said straps including concavo-convex shoulder-engaging portions and having first ends attached near said bottom end of said frame and second ends secured with respect to said frame at a level below said shoulder-engaging portions;
a generally horizontal bar member forming a part of said frame and extending along at least a portion of a line between said opposite sides of said frame near the top end thereof;

substantially rigid brace members pivotally connected to said generally horizontal member of said frame and extending from said frame, said brace members terminating in free ends generally aligned with said shoulder-engaging portions of said shoulder straps, said brace members being of substantially fixed dimensions between said connections to said frame and said free ends;

and
means connecting said free ends of said brace members with the convex surfaces of said shoulder-engaging portions of said straps.

6. The pack frame suspension means of claim 5 wherein said pivot mountings of said brace members provide sufficient friction for holding said brace members in a generally horizontally extended position when said pack frame suspension means is being mounted on the shoulders of a backpacker.

7. The pack frame suspension means of claim 6 wherein said brace members are made of resilient material deflectable in up and down directions.

8. The pack frame suspension means of claim 7 wherein said connecting means provide a flexible connection between said shoulder braces and said straps.

9. The pack frame suspension means of claim 8 wherein said connecting means comprise pivot bearings.

10. The pack frame suspension means of claim 5, further including a sway adjustment ring secured to said frame, said second ends of said shoulder straps being joined together through said ring thereby permitting adjustment of the relative lengths of the shoulder straps during certain body movements.

11. A pack frame suspension means comprising:
a rigid frame having, when in worn position, top and bottom ends and opposite sides;
flexible shoulder straps adjacent to said frame between said top and bottom ends and said opposite sides, said straps including concavo-convex shoulder-engaging portions and having first ends attached near said bottom end of said frame and second ends secured with respect to said frame at a level below said shoulder-engaging portions;
means for rearwardly spacing the frame from said shoulder straps, and consequently from a wearer's back, said means comprising substantially rigid brace members coupled to said frame near said top end, extending substantially horizontally forwardly from said frame, and terminating in free ends generally aligned with said shoulder-engaging portions of said shoulder straps, said brace members being of substantially fixed dimensions between said couplings to said frame and said free ends, said brace members further being of resilient material deflectable in up and down directions;

and
means connecting said free ends of said brace members with the upper portion of the convex surfaces of said shoulder-engaging portions of said straps.

12. A pack frame suspension means comprising:
a rigid frame having, when in worn position, top and bottom ends and opposite sides;
flexible shoulder straps adjacent to said frame between said top and bottom ends and said opposite sides, said straps including concavo-convex shoulder-engaging portions and having first ends attached near said bottom end of said frame and second ends secured with respect to said frame at a level below said shoulder-engaging portions;
means for rearwardly spacing the frame from said shoulder straps, and consequently from a wearer's back, said means comprising substantially rigid brace members coupled to said frame near said top end, extending substantially horizontally forwardly from said frame, and terminating in free ends generally aligned with said shoulder-engaging portions of said shoulder straps; and
means providing flexible connection of said free ends of said brace members with the upper portion of the convex surfaces of said shoulder-engaging portions of said straps in a manner such that said brace members provide substantially fixed spacing of said frame from said shoulder-engaging portions of said shoulder straps while allowing some freedom of movement.

13. A pack frame suspension means comprising:
a rigid frame having, when in worn position, top and bottom ends and opposite sides;
flexible shoulder straps adjacent to said frame between said top and bottom ends and said opposite sides, said straps including concavo-convex shoulder-engaging portions and having first ends attached near said bottom end of said frame and second ends secured with respect to said frame at a level below said shoulder-engaging portions;

means for rearwardly spacing the frame from said shoulder straps, and consequently from a wearer's back, said means comprising substantially rigid brace members coupled to said frame near said top end, extending substantially horizontally forwardly from said frame, and terminating in free ends generally aligned with said shoulder-engaging portions of said shoulder straps; and
means providing flexible connection of said free ends of said brace members with the upper portion of the convex surfaces of said shoulder-engaging portions of said straps in a manner such that said brace members provide substantially fixed spacing of said frame from said shoulder-engaging portions of said shoulder straps while allowing some freedom of movement.

der-engaging portions and having first ends attached near said bottom end of said frame and second ends secured with respect to said frame at a level below said shoulder-engaging portions; substantially rigid brace members coupled to said frame near said top end, extending from said frame, and terminating in free ends generally aligned with said shoulder-engaging portions of said shoulder straps; and means providing flexible connection of said free ends of said brace members with the convex surfaces of said shoulder-engaging portions of said straps in a manner such that said brace members provide substantially fixed spacing of said frame from said shoulder-engaging portions of said shoulder straps while allowing some freedom of movement, said connecting means comprising pivot bearings.

14. A pack frame suspension means comprising:
 a rigid frame having, when in worn position, top and bottom ends and opposite sides;
 a sway adjustment ring secured to said frame between said top and bottom ends and between said opposite sides;
 flexible shoulder straps adjacent to said frame between said top and bottom ends and said opposite sides, said straps including concavo-convex shoulder-engaging portions between said top end and said sway adjustment ring, said shoulder straps having first ends attached near said bottom end of said frame and second ends joined together through said sway adjustment ring thereby permitting self-adjustment of the relative lengths of the shoulder straps during certain body movements;
 substantially rigid brace members coupled to said frame near said top end, extending from said frame, and terminating in free ends generally aligned with said shoulder-engaging portions of

said shoulder straps, said brace members being of substantially fixed dimensions between said couplings to said frame and said free ends, said brace members further being of resilient material deflectable in up and down directions; and means connecting said free ends of said brace members with the convex surfaces of said shoulder-engaging portions of said straps.

15. A pack frame suspension means comprising:
 a rigid frame having, when in worn position, top and bottom ends and opposite sides;
 a sway adjustment ring secured to said frame between said top and bottom ends and between said opposite sides;
 flexible shoulder straps adjacent to said frame between said top and bottom ends and said opposite sides, said straps including concavo-convex shoulder-engaging portions between said top end and said sway adjustment ring, said shoulder straps having first ends attached near said bottom end of said frame and second ends joined together through said sway adjustment ring thereby permitting self-adjustment of the relative lengths of the shoulder straps during certain body movements;
 substantially rigid brace members coupled to said frame near said top end, extending from said frame, and terminating in free ends generally aligned with said shoulder-engaging portions of said shoulder straps; and means providing flexible connection of said free ends of said brace members with the convex surfaces of said shoulder-engaging portions of said straps in a manner such that said brace members provide substantially fixed spacing of said frame from said shoulder-engaging portions of said shoulder straps while allowing some freedom of movement.

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